**WHAT IS CLAIMED IS:**

1. An automotive lane deviation prevention apparatus comprising:

braking force actuators that adjust braking forces applied to respective road wheels;

sensors that detect a driving state of a host vehicle and a traveling-path condition where the host vehicle is traveling; and

a control unit being configured to be electronically connected to the braking force actuators and the sensors, for controlling the braking force actuators in response to signals from the sensors for lane deviation avoidance purposes; the control unit comprising

(a) a lane-deviation-avoidance (LDA) controlled variable setting section that sets a yaw-moment-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of yaw moment control and a deceleration-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of vehicle deceleration control, based on at least one of the host vehicle's driving state and the traveling-path condition, when the host vehicle has a tendency to deviate from a driving lane; and

(b) a control section that controls the braking force of each of the road wheels based on the yaw-moment-control LDA controlled variable and the deceleration-control LDA controlled variable.

2. An automotive lane deviation prevention apparatus comprising:

braking force actuators that adjust braking forces applied to respective road wheels;

sensors that detect a driving state of a host vehicle and a traveling-path condition where the host vehicle is traveling; and

a control unit being configured to be electronically connected to the braking force actuators and the sensors, for controlling the braking force actuators in response to signals from the sensors for lane deviation avoidance purposes; the control unit comprising

(a) a lane-deviation tendency detection section that determines whether the host vehicle has a tendency to deviate from a driving lane;

(b) a lane-deviation-avoidance (LDA) controlled variable setting section that sets a yaw-moment-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of yaw moment control and a deceleration-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of vehicle deceleration control, based on at least one of the host vehicle's driving state and the traveling-path condition in presence of the host vehicle's lane-deviation tendency;

(c) a desired yaw moment calculation section that calculates a desired yaw moment based on the yaw-moment-control LDA controlled variable so that a yaw moment is produced in a direction in which the host vehicle's lane-deviation tendency is avoided;

(d) a deceleration-control controlled variable calculation section that calculates a controlled variable for the deceleration control based on the deceleration-control LDA controlled variable; and

(e) a control section that controls the braking force of each of the road wheels based on the desired yaw moment and the controlled variable for the deceleration control.

3. The automotive lane deviation prevention apparatus as claimed in claim 2, wherein:

the LDA controlled variable setting section sets both of the yaw-moment-control LDA controlled variable and the deceleration-control LDA controlled variable, based on a host vehicle's yaw angle corresponding to an orientation of the host vehicle with respect to a direction of the host vehicle's driving lane.

4. The automotive lane deviation prevention apparatus as claimed in claim 2, further comprising:

a future lane-deviation estimate calculation section that calculates a future lane-deviation estimate as a difference between an absolute value of a lateral-displacement estimate and a predetermined lateral-displacement criterion, the lateral-displacement estimate being determined based on at least a host vehicle's lateral deviation corresponding to a position of the host vehicle relative to a central axis of the driving lane; and

wherein the LDA controlled variable setting section limits the yaw-moment-control LDA controlled variable based on at least one of the host vehicle's driving state and the traveling-path condition, by preferentially allotting the future lane-deviation estimate to the yaw-moment-control LDA controlled variable and by allotting the remainder of the future lane-deviation estimate to the deceleration-control LDA controlled variable.

5. The automotive lane deviation prevention apparatus as claimed in claim 2, wherein:

the LDA controlled variable setting section sets the yaw-moment-control LDA controlled variable based on at least one of a curvature of the driving lane and a host vehicle's

lateral deviation corresponding to a position of the host vehicle relative to a central axis of the driving lane, and sets the deceleration-control LDA controlled variable based on a host vehicle's yaw angle corresponding to an orientation of the host vehicle with respect to a direction of the host vehicle's driving lane.

6. The automotive lane deviation prevention apparatus as claimed in claim 5, wherein:

the LDA controlled variable setting section comprises a yaw-moment-control initiation threshold value setting portion that sets a yaw-moment-control initiation threshold value based on the curvature of the driving lane and a deceleration-control initiation threshold value setting portion that sets a deceleration-control initiation threshold value based on the host vehicle's yaw angle corresponding to the orientation of the host vehicle with respect to the direction of the host vehicle's driving lane; and

the LDA controlled variable setting section determines the desired yaw moment based on the yaw-moment-control LDA controlled variable and the yaw-moment-control initiation threshold value, and determines the controlled variable for the deceleration control based on the deceleration-control LDA controlled variable and the deceleration-control initiation threshold value.

7. The automotive lane deviation prevention apparatus as claimed in claim 4, wherein:

the lateral-displacement estimate is arithmetically calculated from the following expression

$$XS = Tt \times V \times (\phi + Tt \times V \times \beta) + X$$

where Tt is a headway time between the host vehicle and a preceding vehicle both driving in the same sense and in the same lane, V is a host vehicle speed, $\phi$ is a host vehicle's yaw angle corresponding to an orientation of the host vehicle with respect to a direction of the host vehicle's driving lane, $\beta$ is a curvature of the host vehicle's driving lane, and X is the host vehicle's lateral deviation corresponding to the position of the host vehicle relative to the central axis of the driving lane.

8. The automotive lane deviation prevention apparatus as claimed in claim 2, wherein:

the desired yaw moment for the yaw moment control is arithmetically calculated from the following expression

$$Ms = -Kv1 \times Ks \times Xm$$

where Kv1 is a proportional gain that is determined by specifications of the host vehicle, Ks is a proportional gain that is determined by a host vehicle speed, and Xm is the yaw-moment-control LDA controlled variable, and

the controlled variable for the deceleration control is arithmetically calculated from the following expression

$$Pg = Kv2 \times Ks \times |Xd|$$

where Kv2 is a proportional gain that is determined by specifications of the host vehicle, Ks is the proportional gain that is determined by the host vehicle speed, and Xd is the deceleration-control LDA controlled variable.

9. The automotive lane deviation prevention apparatus as claimed in claim 6, wherein:

the yaw-moment-control LDA controlled variable is arithmetically calculated from the following expression

$$Xm = Tt \times V \times (Tt \times V \times \beta) + X$$

Where Tt is a headway time between the host vehicle and a preceding vehicle both driving in the same sense and in the same lane, V is a host vehicle speed, β is the curvature of the host vehicle's driving lane, and X is the host vehicle's lateral deviation corresponding to the position of the host vehicle relative to the central axis of the driving lane, and

the deceleration-control LDA controlled variable is arithmetically calculated from the following expression

$$Xd = Tt \times V \times \phi$$

Where Tt is the headway time between the host vehicle and the preceding vehicle both driving in the same sense and in the same lane, V is the host vehicle speed, and ϕ is the host vehicle's yaw angle corresponding to an orientation of the host vehicle with respect to a direction of the host vehicle's driving lane, and

the desired yaw moment for the yaw moment control is arithmetically calculated from the following expression

$$Ms = -K1 \times K2 \times (Xm - Xcm)$$

where K1 is a proportional gain that is determined by specifications of the host vehicle, K2 is a proportional gain that is determined by the host vehicle speed, Xm is the yaw-moment-control LDA controlled variable, and Xcm is the yaw-moment-control initiation threshold value, and

the controlled variable for the deceleration control is arithmetically calculated from the following expression

$$Pg = Kv2 \times Ks \times |Xd - Xcd|$$

where Kv2 is a proportional gain that is determined by specifications of the host vehicle, Ks is the proportional gain that is determined by the host vehicle speed, Xd is the deceleration-control LDA controlled variable, and Xcd is the deceleration-control initiation threshold value.

10. A method of preventing lane deviation of a host vehicle equipped with braking force actuators that adjust braking forces applied to respective road wheels and sensors that detect a driving state of the host vehicle and a traveling-path condition where the host vehicle is traveling, the method comprising:

setting a yaw-moment-control lane-deviation-avoidance (LDA) controlled variable used to avoid the host vehicle's lane deviation by way of yaw moment control and a deceleration-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of vehicle deceleration control, based on at least one of the host vehicle's driving state and the traveling-path condition, when the host vehicle has a tendency to deviate from a driving lane; and

controlling the braking force of each of the road wheels based on the yaw-moment-control LDA controlled variable and the deceleration-control LDA controlled variable.

11. The method as claimed in claim 10, further comprising:

calculating a desired yaw moment based on the yaw-moment-control LDA controlled variable so that a yaw moment is produced in a direction in which the host vehicle's lane-deviation tendency is avoided;

calculating a controlled variable for the deceleration control based on the deceleration-control LDA controlled variable; and

controlling the braking force of each of the road wheels based on the desired yaw moment and the controlled variable for the deceleration control.

12. The method as claimed in claim 10, further comprising:

calculating a yaw-moment-control initiation threshold value based on a curvature of the driving lane;

calculating a deceleration-control initiation threshold value based on a host vehicle's yaw angle corresponding to an orientation of the host vehicle with respect to a direction of the host vehicle's driving lane;

calculating a desired yaw moment based on the yaw-moment-control LDA controlled variable and the yaw-moment-control initiation threshold value so that a yaw moment is produced in a direction in which the host vehicle's lane-deviation tendency is avoided;

calculating a controlled variable for the deceleration control based on the deceleration-control LDA controlled variable and the deceleration-control initiation threshold value; and

controlling the braking force of each of the road wheels based on the desired yaw moment and the controlled variable for the deceleration control.

13. An automotive lane deviation prevention apparatus comprising:

braking force adjusting means for adjusting braking forces applied to respective road wheels;

sensor means for detecting a driving state of a host vehicle and a traveling-path condition where the host vehicle is traveling; and

a control unit being configured to be electronically connected to the braking force adjusting means and the sensor means, for controlling the braking force adjusting means in response to signals from the sensor means for lane deviation avoidance purposes; the control unit comprising

(a) lane-deviation-avoidance (LDA) controlled variable setting means for setting a yaw-moment-control LDA

controlled variable used to avoid the host vehicle's lane deviation by way of yaw moment control and a deceleration-control LDA controlled variable used to avoid the host vehicle's lane deviation by way of vehicle deceleration control, based on at least one of the host vehicle's driving state and the traveling-path condition, when the host vehicle has a tendency to deviate from a driving lane; and

(b) control means for controlling the braking force of each of the road wheels based on the yaw-moment-control LDA controlled variable and the deceleration-control LDA controlled variable.